

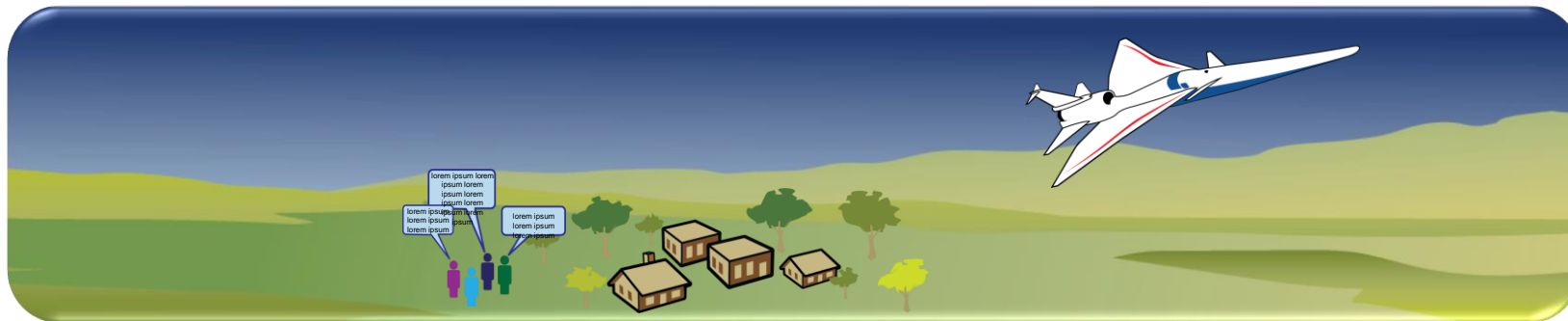


NASA Community Response Testing

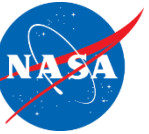
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March 31, 2022



Approach to Meeting Critical Commitment



NASA ARMD Thrust 2 Critical Commitment:

Deliver to ICAO a database of community response to quiet supersonic aircraft flight over land

- Develop survey design and statistical analysis methods to quantify sonic boom annoyance levels
 - Develop experimental and prediction methods to estimate sonic boom exposure over a large area
 - Develop large-scale geolocation methods and means to correlate with annoyance and exposure
 - Plan and execute X-59 overflight tests over large non-experienced communities across the U.S.
 - Acquire survey data
 - Acquire acoustic data and estimate exposure levels
 - Correlate survey and exposure data to establish dose-response relationship
- ***Provide nationally-representative dose-response database to ICAO for CAEP14***

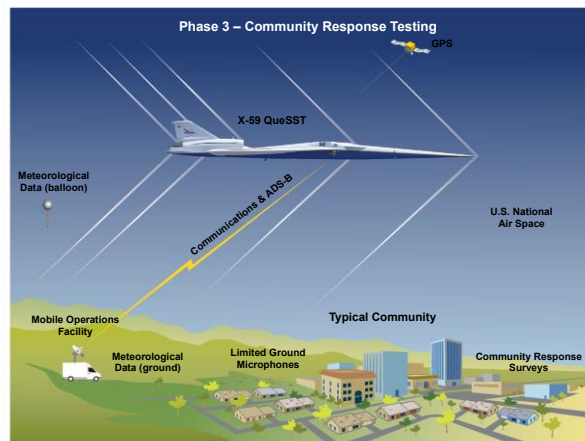
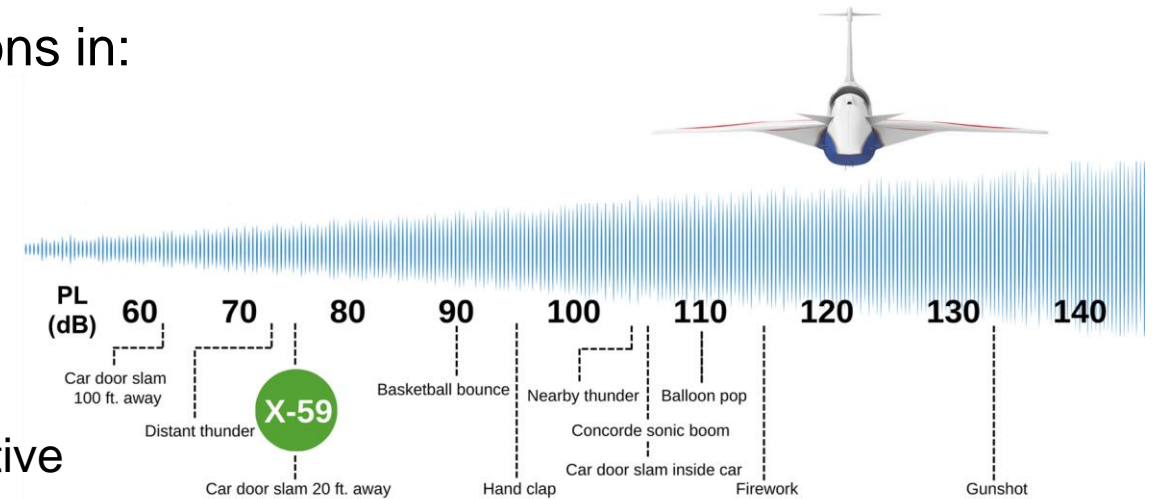


LBFD Mission Phase 3 – Community Response Testing

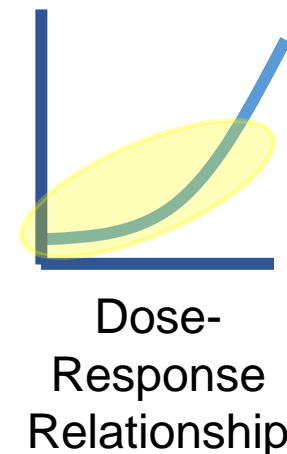


FOCUS: Provide data to support noise certification standards development

- 4-6 community tests over multiple sites, w/ variations in:
 - Climate zones
 - Population demographics
 - Urbanization levels
- Scope
 - Daytime/waking hours
 - Range of exposure levels, single-event and cumulative
 - Community response representative of general population



- **Exposure Estimation**
- **Community Surveys**

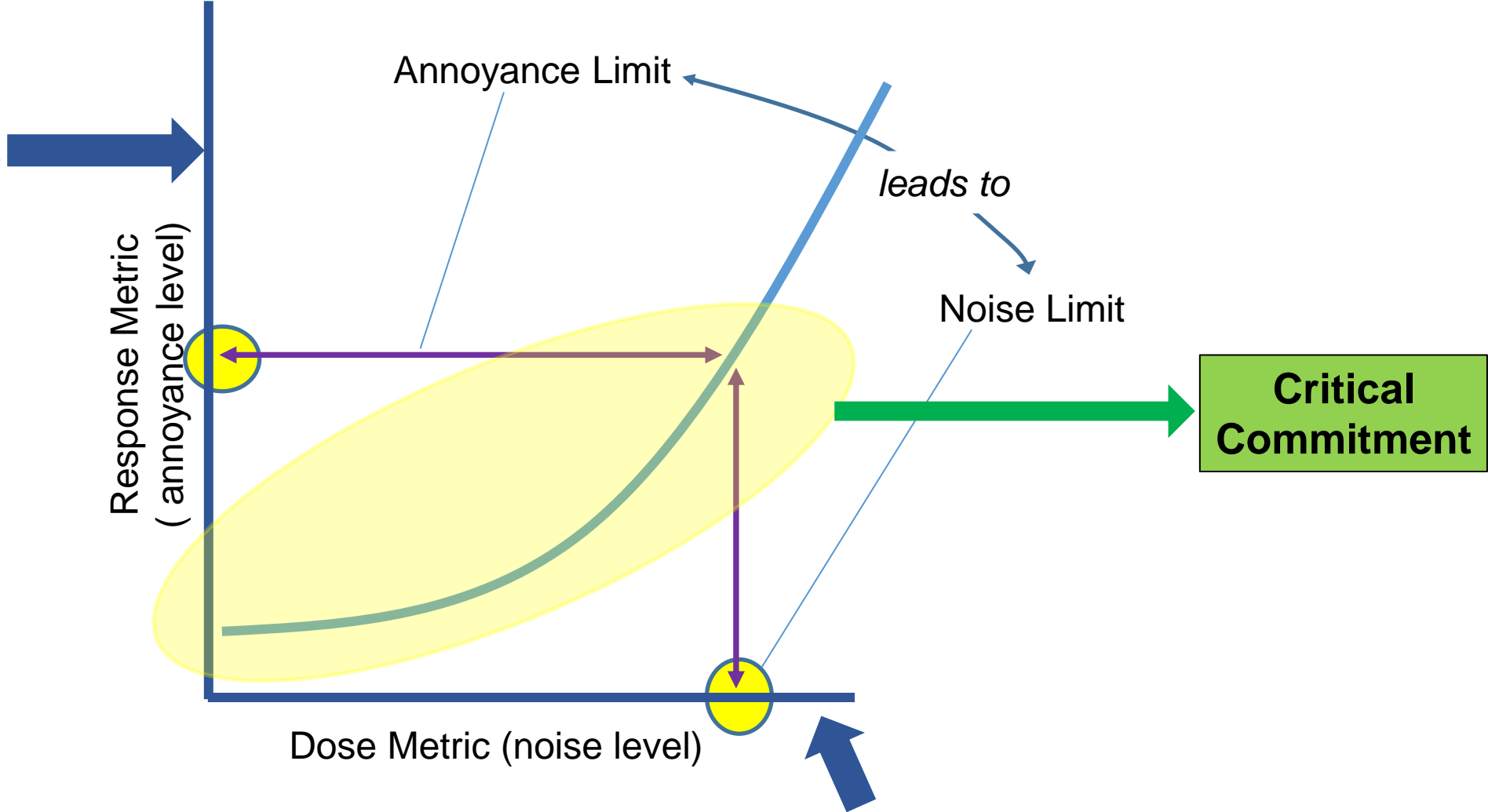


**ICAO
CAEP 14**

Dose – Response Characterization



Quantifying Y-axis:
Community Survey
Design/Analysis



Quantifying X-axis: Exposure Design and Estimation

NASA Community Test Workshops



Second Virtual International Workshop Dec 13-14

- **Workshop Goals**

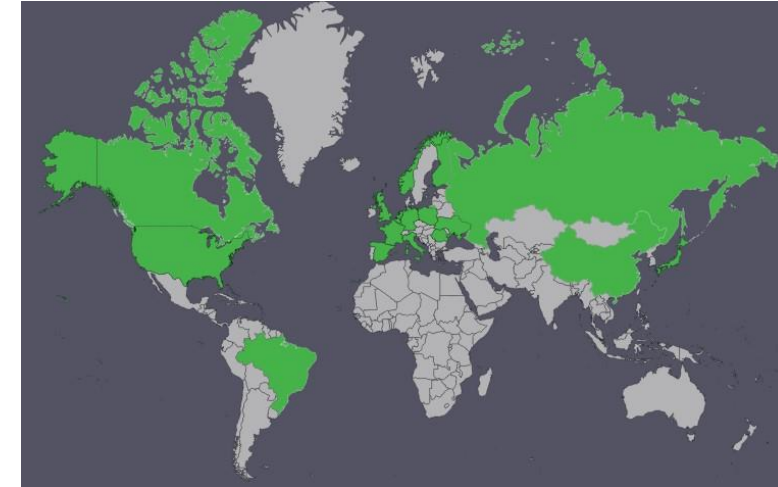
- Communicate current status and overall plans for community testing
- Provide details on intended approaches for key elements
- Obtain feedback from attendees
- Identify any significant concerns on suitability of the proposed approaches and dataset as basis for international standards

- **Participation/remarks by FAA OEE (Sandy Liu)**

- Regulatory perspective
- Context for application of results to standards development

- **First major opportunity to convey intended scope of NASA plans**

- Approach for airfield and community test locations
- Technical approaches for:
 - Collecting and analyzing survey data
 - Characterizing boom exposure
 - Developing dose-response relationships



Broad International Participation

- 18 Countries
 - 120+ Attendees
 - 50+ Organizations
- | | |
|--------------|------------------------|
| - Research | - Academia |
| - Regulatory | - Industry – Technical |
| - Government | - Industry - OEM |

Key takeaways from workshop

- **Robust interchanges and discussions**
- **Applicability of dataset to world vs US – *substantial interest***
 - What methods can be employed to expand representativeness?
 - Improved survey designs? Expanded testing to encompass wider demographics or environments?
- **Questions and recommendations for obtaining structural vibration data during Phase 3**
 - How to characterize relationship of annoyance levels to rattle/vibration?
 - Scope of additional data acquisition and analysis requirements?
- **Solicited input on potential participation/collaboration to address above concerns**
- **Further discussions with key SME's are planned to address technical approaches**
 - Supports development of international consensus
 - Incorporation of inputs to final survey and exposure design/analysis plans

Community Testing Overall Timeline



2020	2021	2022	2023	2024	2025	2026	2027
<i>Planning Stage</i>				<i>Execution Stage</i>			
<ul style="list-style-type: none"> Develop overall LBFD Phase 3 plans <ul style="list-style-type: none"> Survey design Exposure estimation Operations Public outreach and communication Risk reduction activities <ul style="list-style-type: none"> Survey test Acoustic monitor and infrastructure checkout Automated data processing validation Obtain feedback on survey methods and exposure estimation approaches <ul style="list-style-type: none"> ICAO WG1 participation Virtual and in-person international workshops Independent review panel 				<ul style="list-style-type: none"> Community Test 1 near AFRC Additional community tests <ul style="list-style-type: none"> Various regions Participant demographics Survey and exposure data analysis Develop dose-response relationship Aggregate analyses and extend to nationally-representative database 			<p>Database delivery for CAEP14</p>